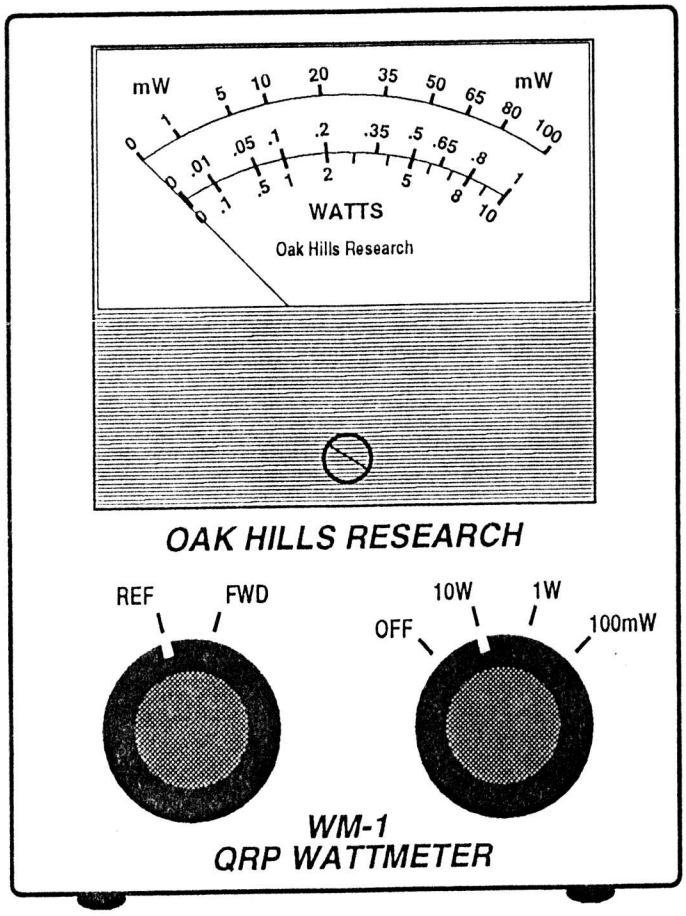
10/92

ASSEMBLY INSTRUCTIONS

WM-1 WATTMETER



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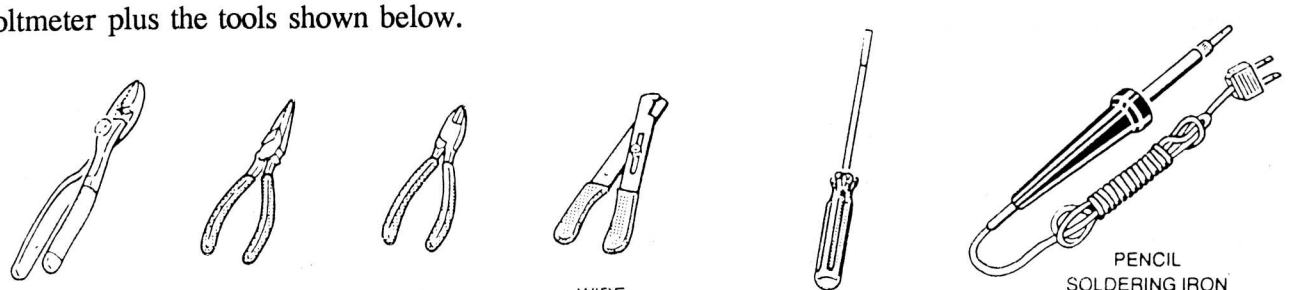
INTRODUCTION

Thank you for purchasing the WM-1 QRP wattmeter. This wattmeter was designed for the QRP operator and builder. It has three selectable full scale power levels that cover the power ranges most often used by QRP operators and builders. You can measure power down to the low milliwatt range. The unit is battery powered making it great for portable use. The WM-1 is easy to build and align. A source of RF is not required for alignment.

You will need the following tools and test equipment to assemble and align your kit: a digital voltmeter plus the tools shown below.



Soldering is one of the most important operations you will perform while assembling your kit. About 95% of all kits returned to us for repair have problems caused by poor soldering. A good solder connection will form an electrical connection between two parts, such as a component lead and a circuit board foil. A bad solder connection could prevent an otherwise well-assembled kit from operating properly. It is easy to make good solder connections if you follow a few simple rules. Use the correct type of soldering iron. A 22 to 25 watt pencil soldering iron with a 1/8" or 3/16" chisel tip works best. Keep the soldering iron tip clean. Wipe it often on a wet sponge or cloth, then apply solder to the tip to give the entire tip a wet look. This process is called tinning, and it will protect the tip and enable you to make good connections. When solder tends to "ball" or does not stick to the tip, the tip needs to be cleaned and retinned. ALWAYS use ROSIN CORE, radio-type solder (60:40 tin-lead content) for all of the soldering in this kit. The warranty will be void and we will not service any kit in which acid core solder or paste has been used.

Each kit is supplied with a blown-up diagram of the component screen of the board, and a schematic diagram. These will help idenify components and their locations.

ASSEMBLY

1) Open the parts packages and check components against the parts list. Component R7, a PC mount trim pot, is shown on the component screen diagram and on the PC board. This pot is not used and is not included in the kit.

2) Refer to the component screen diagram, parts list and schematic diagram for the following steps. When you install components on the PC board, insert the part through the holes and bend the leads slightly on the solder side to hold it in place. When installing the IC sockets, be sure to match the half-moon end of the socket with the half-moon end shown on the board. Be sure to observe the correct polarity of the electrolytic capacitor and the diodes. All components, except for the trim pots, mount against the board.

3) Position the PC board in front of you with component side up. Install resistors R1 and R2. Solder and trim. Save one of the cut off leads.

4) Install R3, R4, R5, R9. Solder and trim.

5) Install R10, R11, R13, R14. Solder and trim.

6) Install trim pots R6, R8, R12, R15. Solder and trim.

7) Install D1, D2, D3. Position banded end as shown. Solder and trim.

8) Install IC sockets at U1 and U2. Position half-moon as shown. Solder as you install.

9) Install C1, C2, C3, C4. Observe the correct polarity of C4. The long lead is always positive. Solder and trim.

add C5

10) Hold one of the black toroid mounts in your hand. Position it so the four protruding pins are facing down. Insert one of the pre-wound toroid coils into the top pocket of the mount. Engage the wire leads into the "V" shaped slots on each side of the mount. Insert the wire leads through the holes in the board at T1. From the solder side, pull the wire leads to remove any excess slack and bend to one side to hold in place. Solder and trim the leads. Use the same procedure for T2.

11) Install a short jumper at JP1. Use a cut off component lead. Leave about a 1/4" loop in this jumper. Solder and trim.

12) Locate the RG58 coax cable. Cut two 3 1/2" lengths. At one end of each cable, carefully remove 1" of the black outer jacket. Be very careful not to cut into the braid. Comb the braid out into single strands. Twist the braid strands to form a lead. Remove 1/2" of inner conductor insulation without nicking or cutting into the wire strands. Tin both leads. Use just enough heat and solder to quickly tin the lead. Too much heat will melt the insulation. At the other end of each cable, remove 1" of black outer jacket AND the braid. Remove 1/2" of insulation from the inner conductor. Quickly tin the leads.

ASSEMBLY (cont)

13) Position the PC board in front of you with the component side up and the IC sockets closest to you. Install one of the cut off leads from the large resistors at the hole location labeled "BARE". This hole is located at the upper right corner.

14) Position one of the 3 1/2" coax cables with the braid on the right. From the right side of T2, slide the end of the cable without the braid through the center of the toroid. Insert the braid lead through the hole labeled "BRAID". Bend the inner conductor wire down so the lead lines up with the hole labeled "CENTER" and insert the lead. Do this at both ends. Solder all three leads and trim.

15) Insert the other coax through T1, except this time the braid goes on the left side. Insert the braid into its hole. Solder and trim. The inner conductors will be connected later.

16) Locate the 12" length of 8 conductor cable. Using your diagonal cutters, cut the grey outer jacket back an inch or so to expose the wire ends. Start pulling the wires out one at a time. You will use this wire for all connections.

17) In this step you will cut the wires to the indicated lengths and then prepare the ends. To prepare the ends, simply remove 1/4" of insulation. Use a GOOD quality pair of wire strippers. DO NOT use a knife or diagonal cutters to remove the insulation. You will be constantly repairing broken wires on the board. Prepare the following wires:

2" BLACK - This wire will be connected later
3" BLACK - to "M1 -"
4 1/2" BLACK - to ".1W"
6" BROWN - to "BRN TO S1"
3" RED - to "M1 +"
5" RED - to "RED TO S1"
4 1/2" ORANGE - to "WIP"
4 1/2" GREEN - to "1W"
5" BLUE - This wire will be connected later
5" YELLOW - to "S1"
1" YELLOW - to "TP1"
2 1/2" WHITE - to "S2A"

18) Install the above prepared wires on the board at the locations indicated above. Solder each lead as you install it. The free ends will be connected shortly. While this PC board is not too densely packed with parts, some of the board traces are close together. Be careful when soldering not to cause a solder bridge between traces or pads. A large diagram showing the solder-side foil pattern of the board has been included to assist you in locating solder bridges. If you do find a bridge, it can be removed with solder braid.

ASSEMBLY (cont)

19) Position the board with component side up and the IC sockets facing away from you. Dress the BLACK, ORANGE and GREEN wires to the left. Dress the BROWN, RED and YELLOW wires to the right. Locate the two rotary switches. You will notice a tab on the front side of each switch. Bend these tabs out to the side.

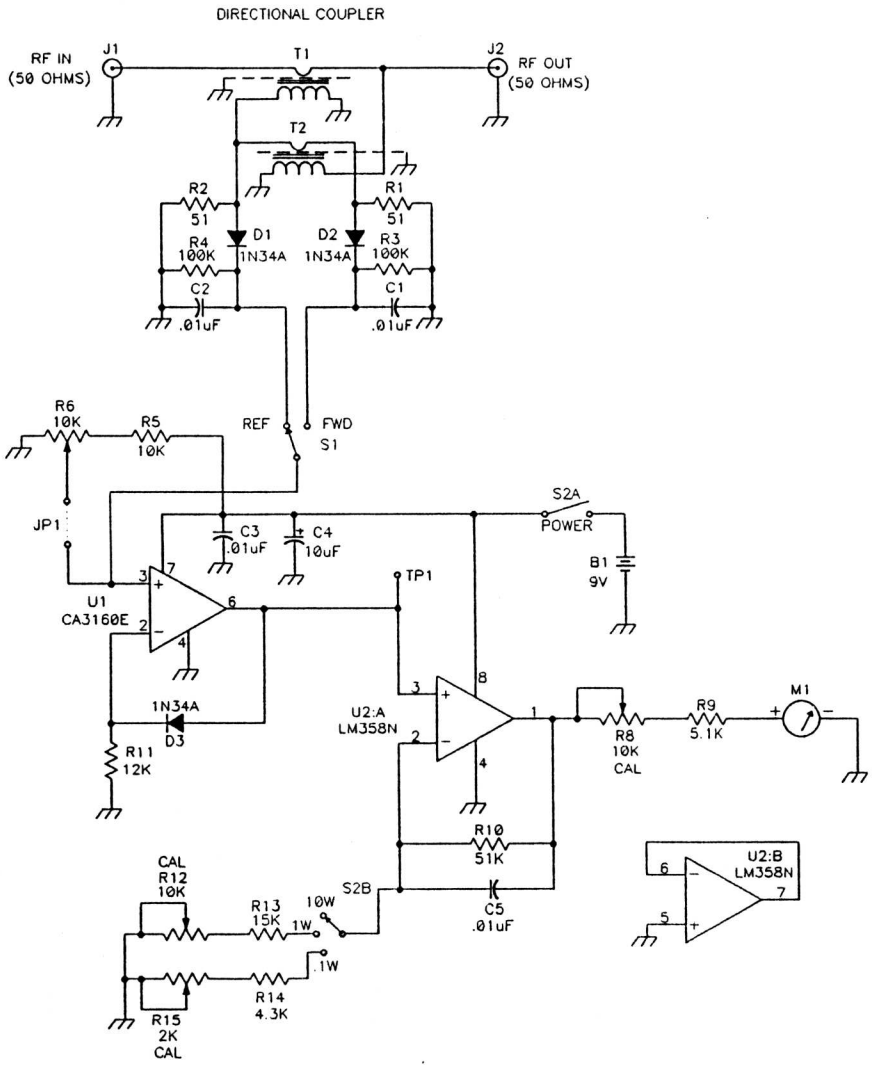
20) Refer to Fig 2 on the pictorial sheet and position switch S1 as shown. Switch S1 is a two position switch and has the most terminals of the two switches. If necessary, hold the switch and turn the shaft with your pliers and count the positions. When you have the correct switch, position it with the terminals facing you and the bent out tab to the right. Connect and solder the YELLOW, BROWN and RED wires coming from the board to the correct terminals as indicated in Fig 2.

21) Position the other rotary switch, S2 as shown in Fig 1 with the bent out tab on the left. Connect a cut off component lead from terminal 4 through terminal 5 to terminal 7. See Fig 1. Solder terminals 4 and 5. Connect the WHITE wire to terminal 7 and solder. Connect and solder the remaining wires to switch S2 as shown. The BLUE wire is the one you previously prepared. The RED and BLACK wires connected to "M1 + & -" will be connected shortly. The 1" YELLOW wire connected to "TP1" is used as a test point and is left free. Set the board/switch assembly aside for now.

22) Locate the chassis. With a small piece of sandpaper, remove any paint overspray from the hole locations on the inside floor of the chassis and the inside of the rear panel. A good ground connection is necessary at these locations.

23) Position the chassis upright with the rear panel facing you. Install an SO-239 connector into the hole labeled "LOAD". The connector flange goes on the outside. In the upper left hole of the connector, insert a 4-40 x 5/16" screw through the connector and rear panel. Install a #4 lockwasher and a #4 solder lug and then a #4 nut. Position the solder lug up. Install hardware at the other three hole locations except without a solder lug. Install another SO-239 connector in the other hole. No solder lug is used on this connector. Tighten all hardware. Bend the solder lug down 90 deg from the rear panel.

24) Turn the chassis around so the front is facing you. Position the black battery holder on the inside of the rear panel with its terminals on the right. Line up the holes and insert a 4-40 x 1/4" screw through the battery holder and rear panel. Install a #4 lockwasher and nut. Repeat at the other hole. Tighten the nuts. Connect and solder the previously prepared 2" BLACK wire to the ground solder lug. Solder the other end to the UPPER terminal on the battery holder. From the bottom of the chassis, insert a 4-40 x 1/4" screw with a #4 lockwasher through one of the five holes. Install another #4 lockwasher and a 3/8" threaded spacer and tighten finger tight. Repeat at the other four holes.



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